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# VIRGINIA'S Forest Products Industry: Performance and Contribution to the State's Economy, 1970 to 1980

Con H Schallau, Wilbur R. Maki, Bennett B. Foster, and Clair H. Redmond





## Abbreviations

### States

AL	Alabama
AR	Arkansas
FL	Florida
GA	Georgia
KY	Kentucky
LA	Louisiana
MS	Mississippi
NC	North Carolina
OK	Oklahoma
SC	South Carolina
TN	Tennessee
TX	Texas
VA	Virginia
SO	South
US	United States

### Industries

FPI	Forest Products Industry
LWP	Lumber and Wood Products
PAP	Paper and Allied Products
WF	Wood Furniture

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## Abstract

**Schallau, Con H; Maki, Wilbur R.; Foster, Bennett B.; Redmond, Clair H.**

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Employment and earnings in Virginia's forest products industry, like those of most Southern States, increased between 1970 and 1980. Furthermore, Virginia's share of the Nation's forest products employment and earnings increased during this period. In 1980, the wood furniture segment accounted for the largest share of the industry's employment, but paper and allied products accounted for the largest share of earnings. In 1977, pulp and allied products had higher productivity than either lumber and wood products or wood furniture.

**Keywords:** Forest products industries, economics (forest products industries), employment (forest products industries), Virginia.

## Preface

This report briefly describes Virginia's forest products industry—its composition, location, evolution, and relation to economic activity elsewhere in the State, the South, and the Nation.

Estimates of employment and earnings shown in this report were derived from U.S. Department of Commerce data. All references to dollar amounts are in constant 1977 dollars.

This is one in a series of reports for each of the 13 Southern States. These reports are companions to an analysis of the changing roles of the forest products industries of the South and the Pacific Northwest.

## Highlights

- In 1980, Federal military and civilian employment accounted for more than 60 percent of Virginia's economic base. This high degree of dependency on the Federal Government reflects the State's proximity to Washington, DC, and several military installations within its borders. The forest products industry was the second largest manufacturing segment of the State's economic base.
- The forest products industry accounted for over one-third of the economic base of several counties in central Virginia. Almost one-half of the counties rely on the forest products industry for at least 10 percent of their economic base employment. The importance of the forest products industry increased in many of these areas between 1970 and 1980.
- Growth in employment in Virginia's forest products industry was more than twice the average national rate for this industry. As a result, the State had nearly 2,300 more employees than it would have had if the industry had grown at the average rate.

- In 1980, wood furniture had the largest share of the approximately 60,000 workers employed by Virginia's forest products industry; paper and allied products accounted for the largest share of earnings.
- In 1977, Virginia was fifth among the 13 Southern States in terms of value added by the forest products industry. The State's increase in value added between 1972 and 1977 was, however, less than for all but two Southern States.

## Contents

<b>1</b>	<b>The Forest Products Economy of Virginia</b>
1	The State's Work Force
2	Components of the State's Economic Base
4	Geographical Importance of the State's Forest Products Industry
5	Composition of the State's Forest Products Industry
6	Average Annual Earnings per Worker
7	Value Added by the Forest Products Industry
8	Capital Productivity
<b>9</b>	<b>The Forest Products Industry in the South</b>
9	Importance of the Industry Across the South
10	Industry Composition
12	Growth of Employment
13	Average Annual Earnings
14	Shift in Employment and Earnings
16	Value Added by the Forest Products Industry
17	Capital Productivity
<b>18</b>	<b>Appendix 1</b>
18	Tables
<b>22</b>	<b>Appendix 2</b>
22	Virginia Counties by Sub-State Planning and Development Districts

## The Forest Products Economy of Virginia The State's Work Force

Virginia's estimated full- and part-time work force in 1980 was comprised of an estimated 2.6 million employees and proprietors (see appendix 1, table 1, for sources of employment and earnings data). Virginia's work force grew considerably faster between 1970 and 1980 than did the national average (29.1 versus 22.3 percent). Total earnings—wage and salary payments and proprietorial income—also grew faster than the national average. Measured in constant 1977 dollars, the State's earnings increased by 37.0 percent compared with 27.4 percent for the Nation. As can be seen in the following tabulation, services, manufacturing, retail trade, and State and local government were the State's four largest employer categories:

Employers	Percent of total employment, 1980	
	Virginia	U.S.
Major industries:		
Services	17.44	18.22
Manufacturing (including the forest products industry <sup>1/</sup> )	15.85	19.15
Retail trade	13.23	14.18
State and local government	12.78	12.56
Federal military	6.68	2.30
Federal civilian	6.24	2.81
Self-employed	5.39	6.58
Construction	5.01	4.08
Transportation, communication, and public utilities	4.40	4.84
Finance, insurance, and real estate	4.21	4.95
Subtotal	91.23	89.67
All other industries	8.77	10.33
Total	100.00	100.00

<sup>1/</sup>The forest products industry is comprised of (1) lumber and wood products (SIC 24), except mobile homes (SIC 2451); (2) wood furniture manufacturing (SIC 2511, 2512, 2517, 2521, 2541); and (3) paper and allied products (SIC 26).



## **Components of the State's Economic Base**

Along with total employment there is another and perhaps more important way to judge an industry's contribution to Virginia's economy. For the State's economy to grow and develop, it must attract new dollars so residents can buy goods and services produced elsewhere. The industries that export products and services beyond local boundaries (that is, to elsewhere in the State, to other States, and to the world) and bring in new dollars constitute the area's economic base. Generally speaking, most manufacturing employment is classified as "economic base" (or "basic"), whereas service or residentiary employment (for example, barber shops, realty firms, schools, and local government) is primarily geared to producing for local needs. Some services may, however, be basic. For example, Federal military provides national defense for all the Nation's citizens, and taxpayers outside Virginia provide financial support for this activity.

Residentiary employment is supported by the economic base. Money flowing in provides income for wage earners and entrepreneurs to spend on locally purchased goods and services. In most cases, the economic growth of a region is dependent on the success of its economic base.

We used excess employment and excess earnings techniques to identify the industries that comprise Virginia's (or the sub-State district's) economic base. This approach accepts the national distribution of employment among industries as a norm. Any industry with employment or earnings in excess of this norm is considered to be producing for export markets outside the State (or a sub-State district) and is part of Virginia's economic base. The percentage of Virginia's excess employment and earnings served as an indicator of the State's dependency on a particular industry for generating new dollars from outside the State (table 2 shows how excess employment and industry-dependency indicators for Virginia were calculated). A particular industry may be basic at the local level but not at the State level.

In 1980, 10 industries accounted for 99.02 percent of the State's basic employment and 94.18 percent of basic earnings. Federal military and civilian employment—heavily dependent on governmental activities in the Washington, DC, area—accounts for a major share of the State's basic employment and earnings. In 1980, the forest products industry was the fifth largest component of the economic base in terms of employment and sixth in terms of earnings.

One interesting change involved the personal, miscellaneous business, and repair service industry, which did not qualify as a basic industry in 1970 but did by 1980. This change reflected the growing importance of electronic data processing and consulting services in the vicinity of Washington, DC.

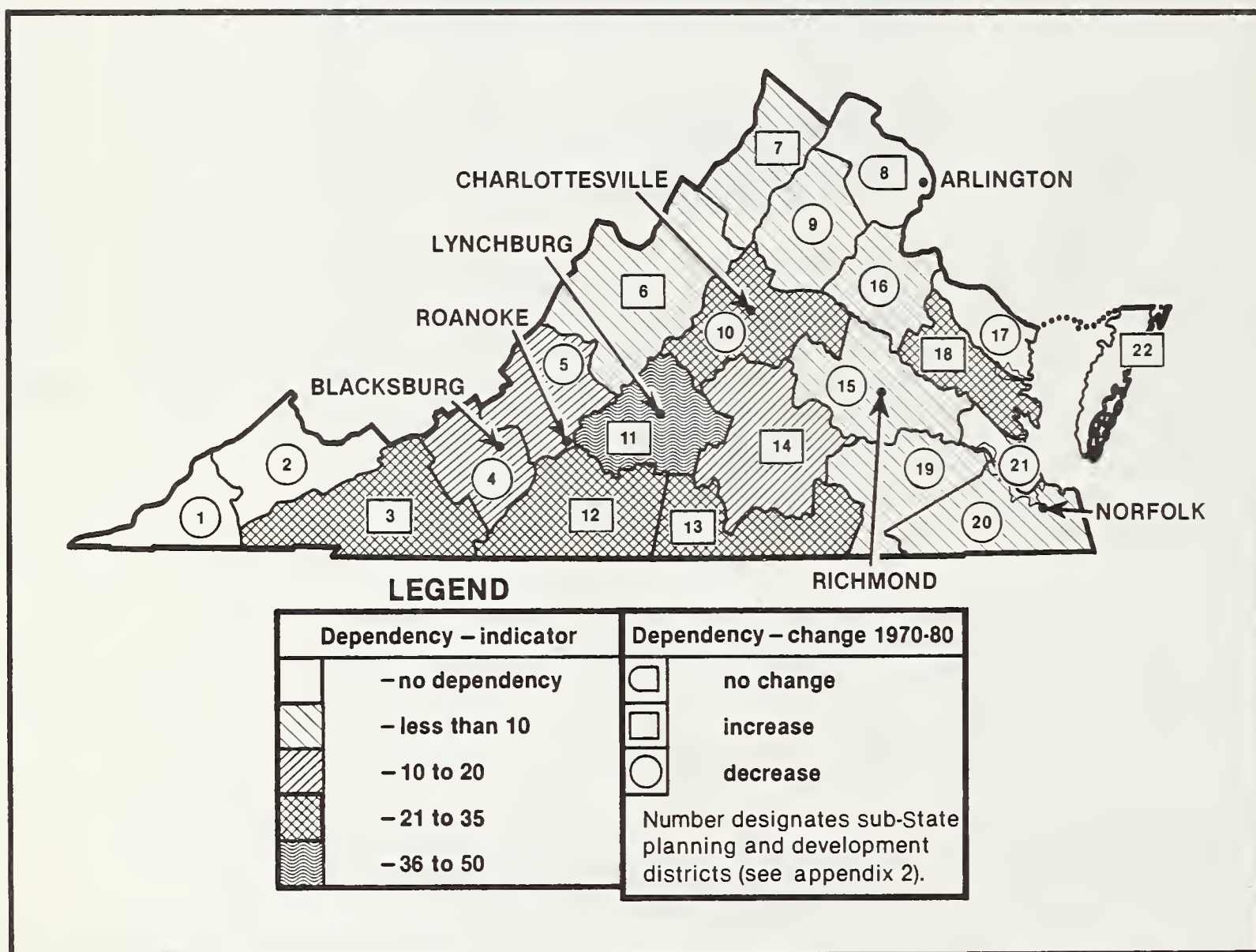


<u>Economic base industries</u>	<u>Employment</u>		<u>Earnings</u>	
	<u>1970</u>	<u>1980</u>	<u>1970</u>	<u>1980</u>
	(Percent of economic base)			
Federal military	35.71	34.04	30.43	27.73
Federal civilian	26.12	26.78	38.05	35.27
Textiles and apparel	8.31	8.20	5.06	5.43
Construction	4.96	7.49	2.01	2.46
Forest products	6.26	6.29	4.28	3.71
Tobacco	4.10	4.69	4.18	6.62
Agriculture	4.91	3.82	<sup>2</sup>	<sup>2</sup>
Coal mining	2.67	3.28	4.27	6.65
Chemical and allied products	5.37	1.30	6.24	1.80
Personal, miscellaneous business, and repair service	<u>0</u>	<u>3.13</u>	<u>0</u>	<u>4.51</u>
Subtotal	98.41	99.02	94.52	94.18
All other industries	<u>1.59</u>	<u>.98</u>	<u>5.48</u>	<u>5.82</u>
Total	100.00	100.00	100.00	100.00

<sup>2</sup>/Less than 0.01 percent.

## Geographical Importance of the State's Forest Products Industry

The contribution of the forest products industry to Virginia's economic base varies considerably between sub-State districts (see appendix 2 for a listing of counties by district). Generally speaking, the forest products industry is more important in south-central Virginia than elsewhere. For example, the forest products industry accounts for more than 35 percent of the economic base employment in the Lynchburg area but for less than 10 percent in the Richmond area. Between 1970 and 1980, dependency on the forest products industry increased in most of the State's more heavily dependent sub-State districts and declined elsewhere.

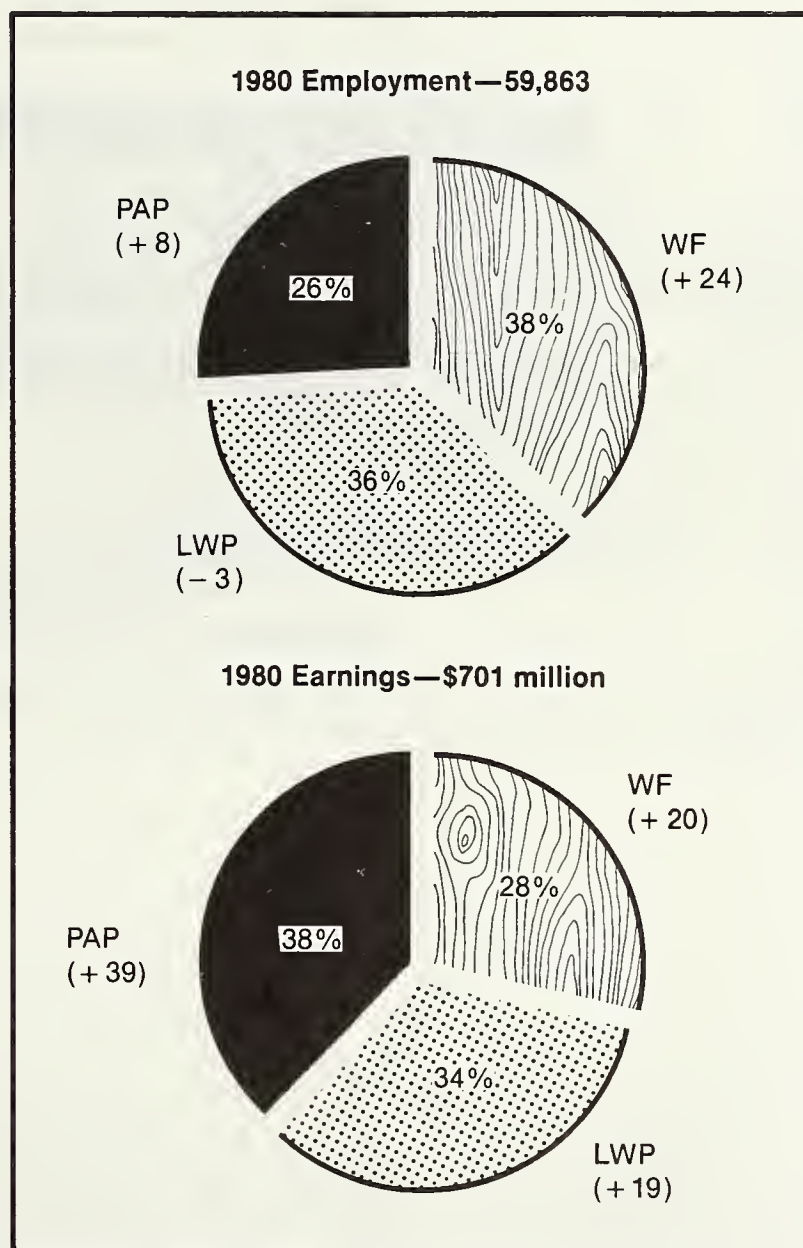


Source: Sub-State estimates for 1970 and 1980 were derived from unpublished county data series provided by the U.S. Department of Commerce, Regional Economic Information System, Washington, DC; and from the Department's *County Business Patterns*. The numbers designate sub-State districts corresponding to the geographical classification of counties as shown in appendix 2.

## Composition of the State's Forest Products Industry

Virginia's forest products industry is comprised of paper and allied products, lumber and wood products, and wood furniture manufacturing. In 1980, wood furniture accounted for the largest share of approximately 60,000 workers employed by Virginia's forest products industry. Paper and allied products had the largest share of earnings in 1980.

During the 1970's, employment in the wood furniture component increased at a substantially faster rate than it did for paper and allied products, while employment dropped in the lumber and wood products component of the industry. The growth rate for wood furniture was nearly the same as the average for all industries in the Nation (22.3 percent). Earnings of paper and allied products increased at a substantially faster rate than for all industries (27.7 percent).



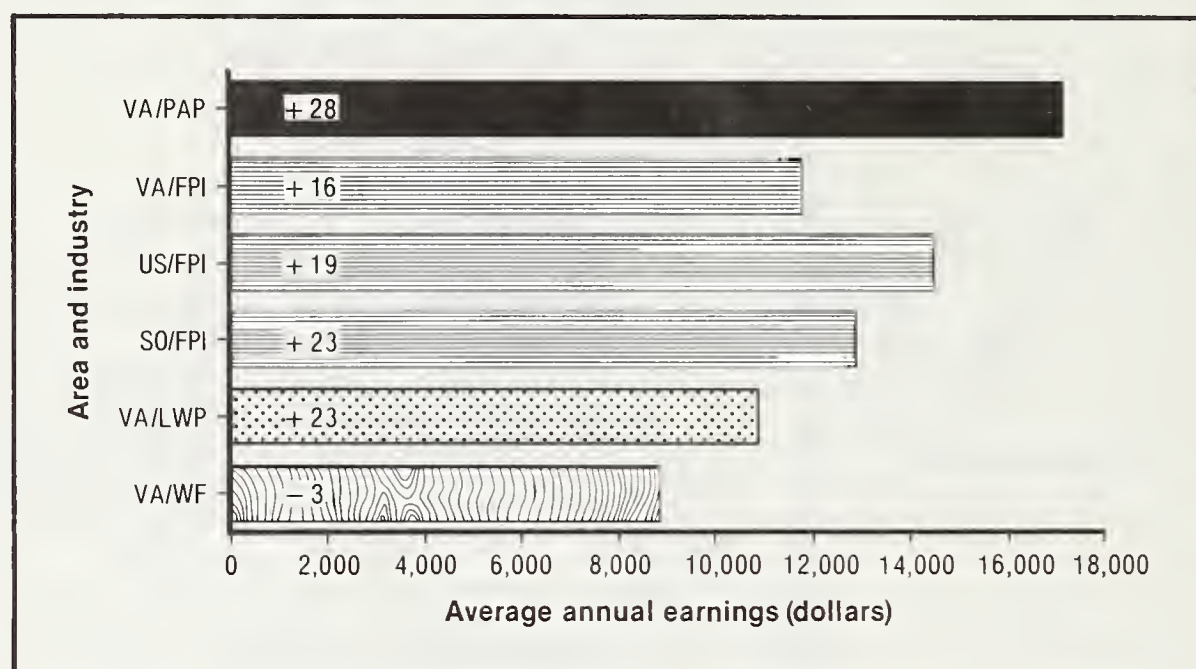
Numbers in parentheses show percentage of change from 1970 to 1980.



## Average Annual Earnings per Worker

Average annual 1980 earnings per worker in paper and allied products were significantly greater than were earnings in the other two components of Virginia's forest products industry. Higher average skill levels, capital investment per worker, and unions account for this difference. Earnings in the wood furniture component were approximately 50 percent of those for paper and allied products and were significantly below the average for all forest products industries in the South and the United States.

The rate of growth in earnings was less for Virginia's forest products industry than for the South and the Nation. The difference resulted from the decrease in average earnings of the wood furniture segment. The rate of growth for lumber and wood products and for paper and allied products was equal to or greater than that for the United States and the South.

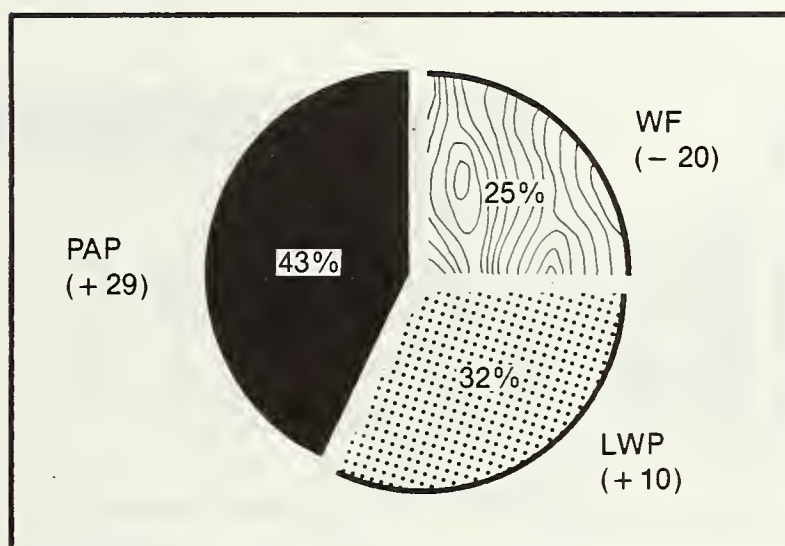


Numbers in bars show percentage of change from 1970 to 1980.

### Value Added by the Forest Products Industry

Value added by manufacturing represents income payments made directly to workers and business owners. It is equal to the value of shipments less the cost of materials, parts, supplies, fuel, goods purchased for resale, electric energy, and contract work. Unlike value of shipments, value added includes only the economic contributions of the State's forest products industry. Consequently, value added by manufacturing is considered a better monetary gauge of the relative economic importance of a manufacturing industry.

In 1977, paper and allied products accounted for the largest share of the \$1.27 billion of value added by Virginia's forest products industry. Between 1972 and 1977, the value added by paper and allied products and by lumber and wood products increased, but value added decreased for wood furniture.

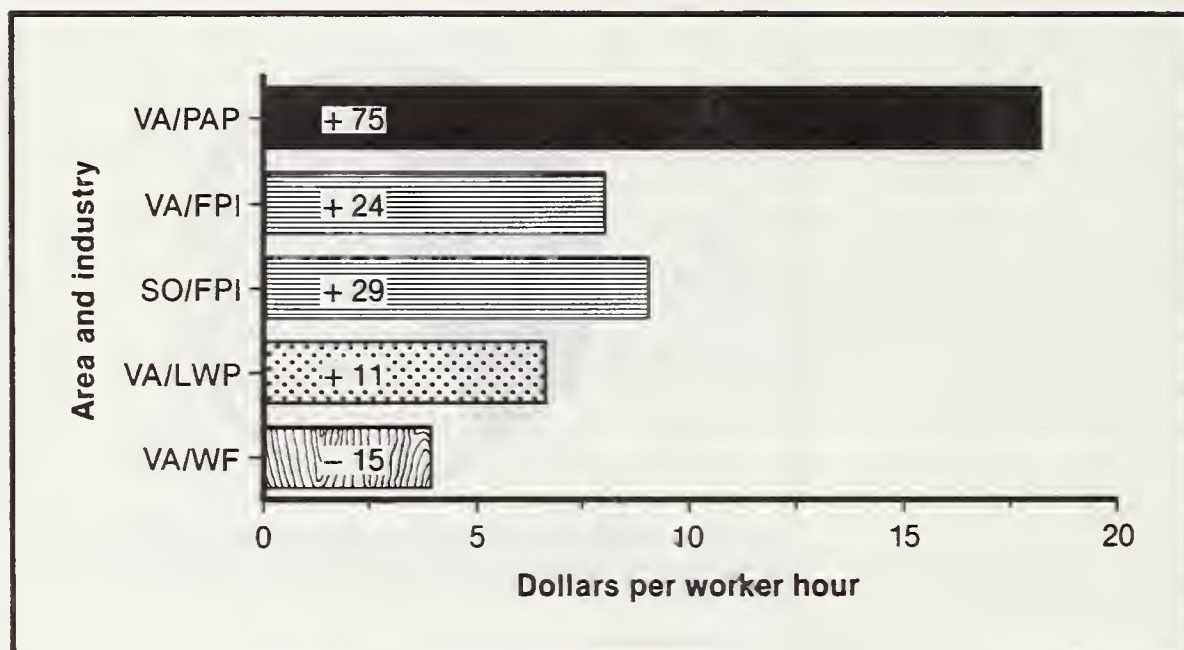


Numbers in parentheses show percentage of change from 1972 to 1977.

## Capital Productivity

Increases in productivity are necessary for an industry to remain competitive in the marketplace. Capital productivity of an industry is measured in terms of value added minus payrolls per worker hour (see table 3 for an explanation of how productivity was calculated for Virginia's forest products industry). This measure of productivity adjusts for wide differences in payroll among industries and represents profits before taxes.

In 1977, the productivity of paper and allied products was much higher than was productivity of the other two segments of Virginia's forest products industry. This is generally the case throughout the South and results from paper and allied products being more capital intensive than the other two segments and having attracted considerable investment funds for new facilities and equipment.



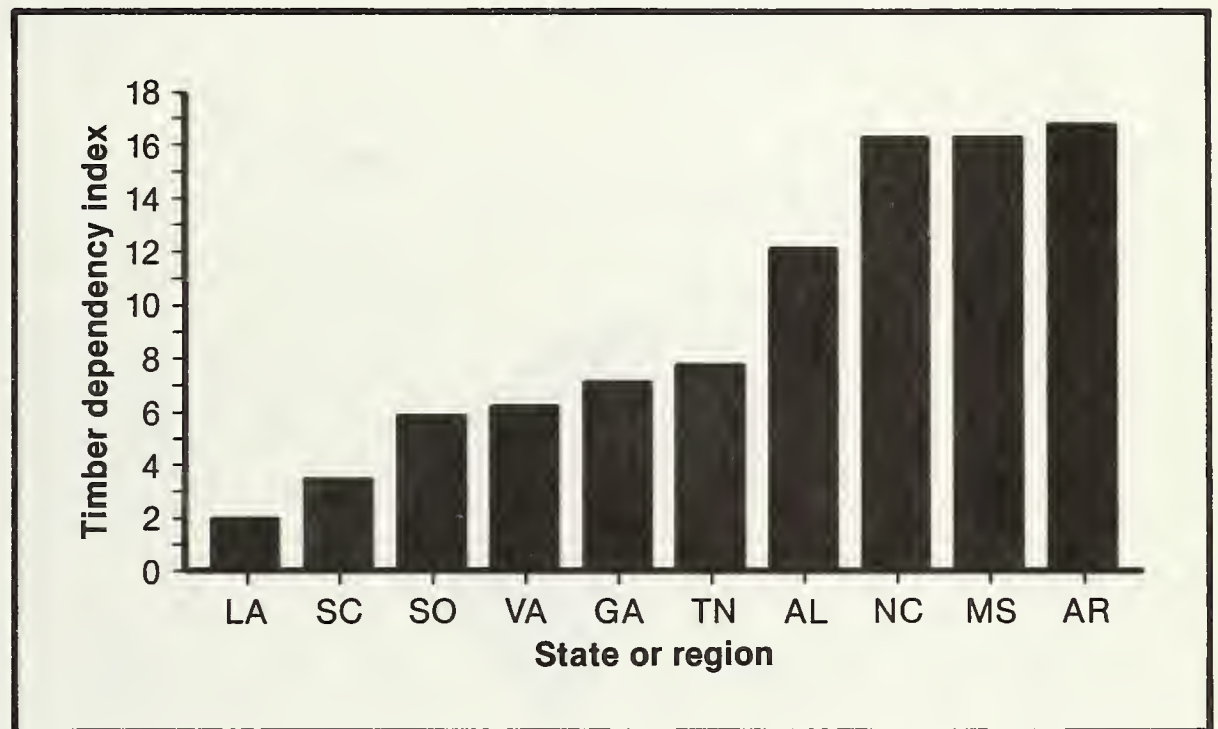
Numbers in bars show percentage of change from 1972 to 1977.



## The Forest Products Industry in the South

### Importance of the Industry Across the South

The dependency indicators suggest that in 1980 all but four States in the South manufactured forest products in excess of statewide needs. Florida, Kentucky, Oklahoma, and Texas were not self-sufficient with respect to forest products. That is, these States imported more forest products than they exported. Consequently, on net balance, their respective forest products industries did not generate new dollars from the outside. In three States—Arkansas, Mississippi, and North Carolina—the forest products industry accounts for approximately one out of six basic employees.



## Industry Composition

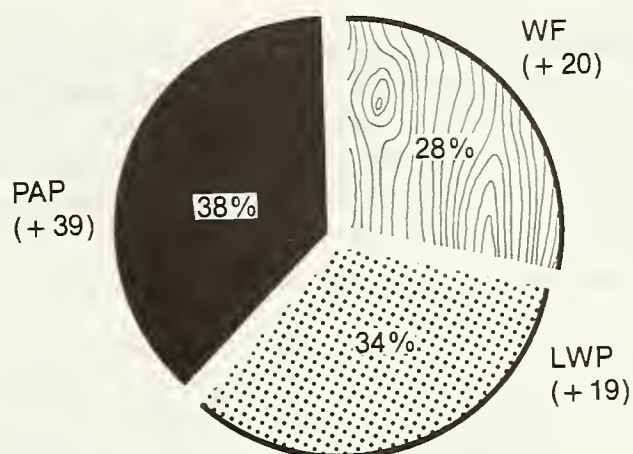
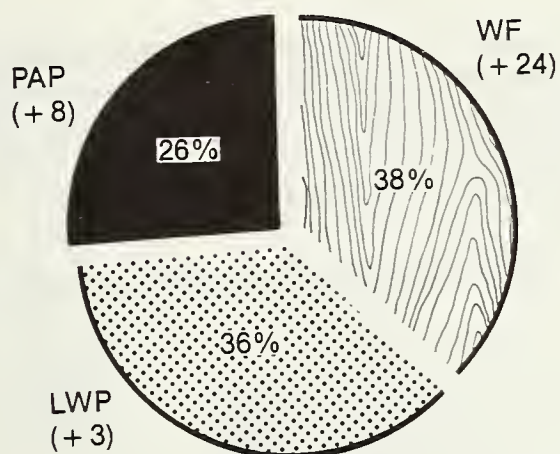
Wood furniture accounted for a much larger share of Virginia's forest products industry employment in 1980 than it did for either the South or the Nation. Furthermore, the rate of growth in Virginia exceeded that for the South and the Nation.

In terms of earnings, Virginia's forest products industry was more evenly divided among the three segments than was the case for the South and the Nation. Growth in earnings for Virginia's forest products industry (26 percent) was less than for the South (36 percent) but greater than for the Nation (23 percent).

## VIRGINIA

1980 Employment—59,863

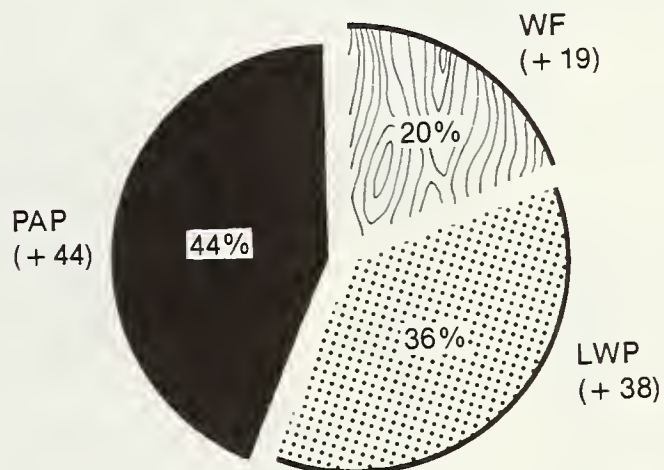
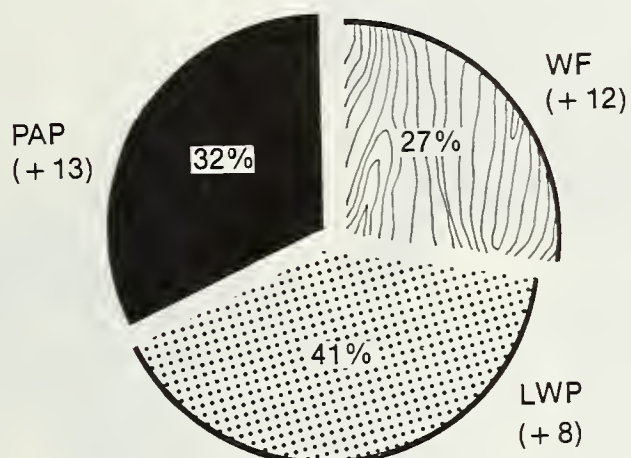
1980 Earnings—\$701 million



## THE SOUTH

1980 Employment—620,567

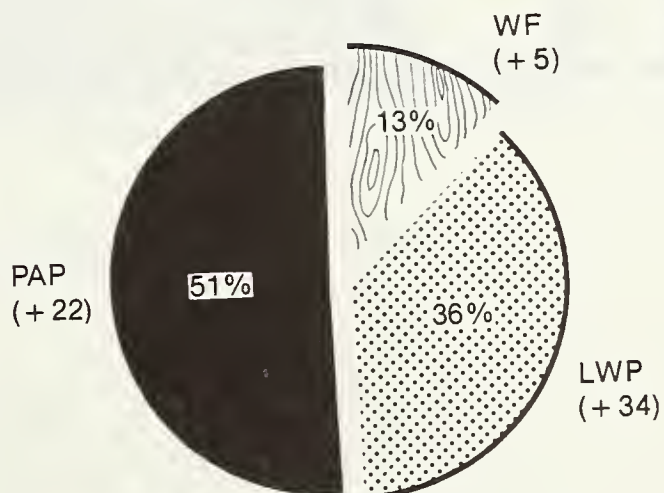
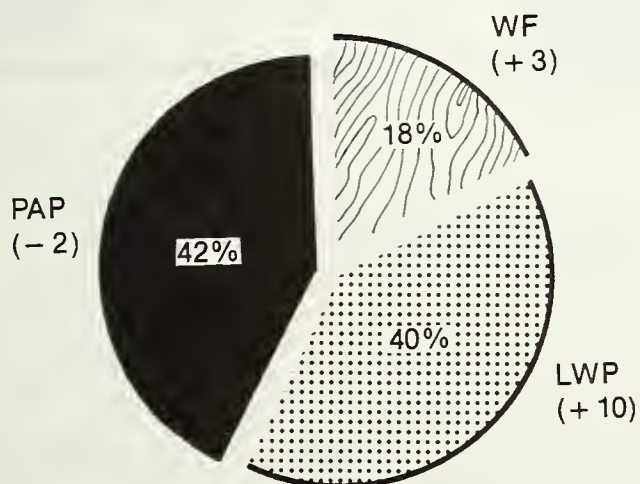
1980 Earnings—\$7.96 billion



## UNITED STATES

1980 Employment—1,634,000

1980 Earnings—\$23.65 billion

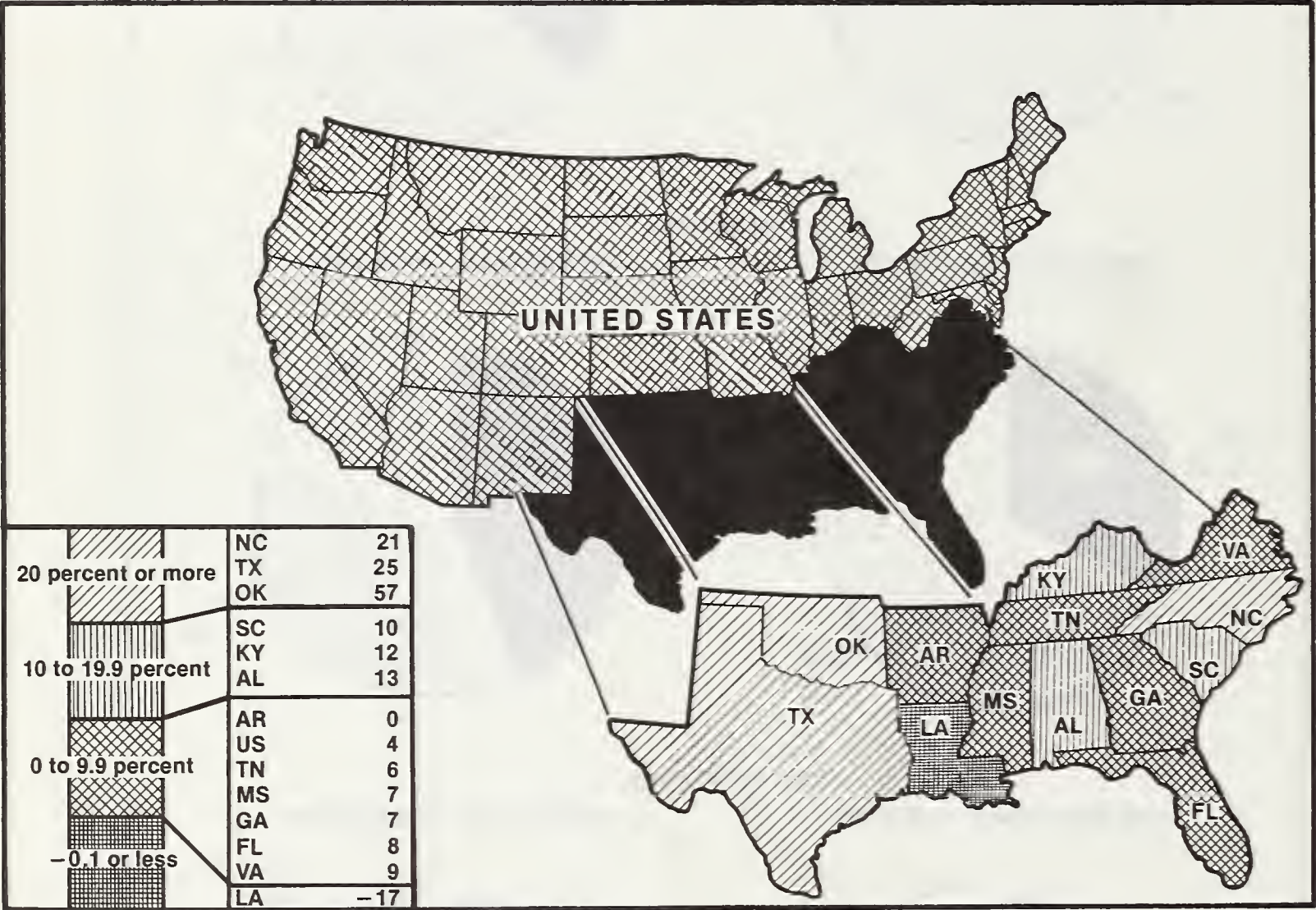


Numbers in parentheses show percentage of change from 1970 to 1980.



Growth of Employment

With the exceptions of Arkansas and Louisiana, forest products industry employment in each of the Southern States grew faster from 1970 to 1980 than did the U.S. counterpart. Employment in two States—Oklahoma and Texas—grew faster than the all-industry average of 22.3 percent. Growth in employment for Virginia's forest products industry was more than twice the industry's national rate.

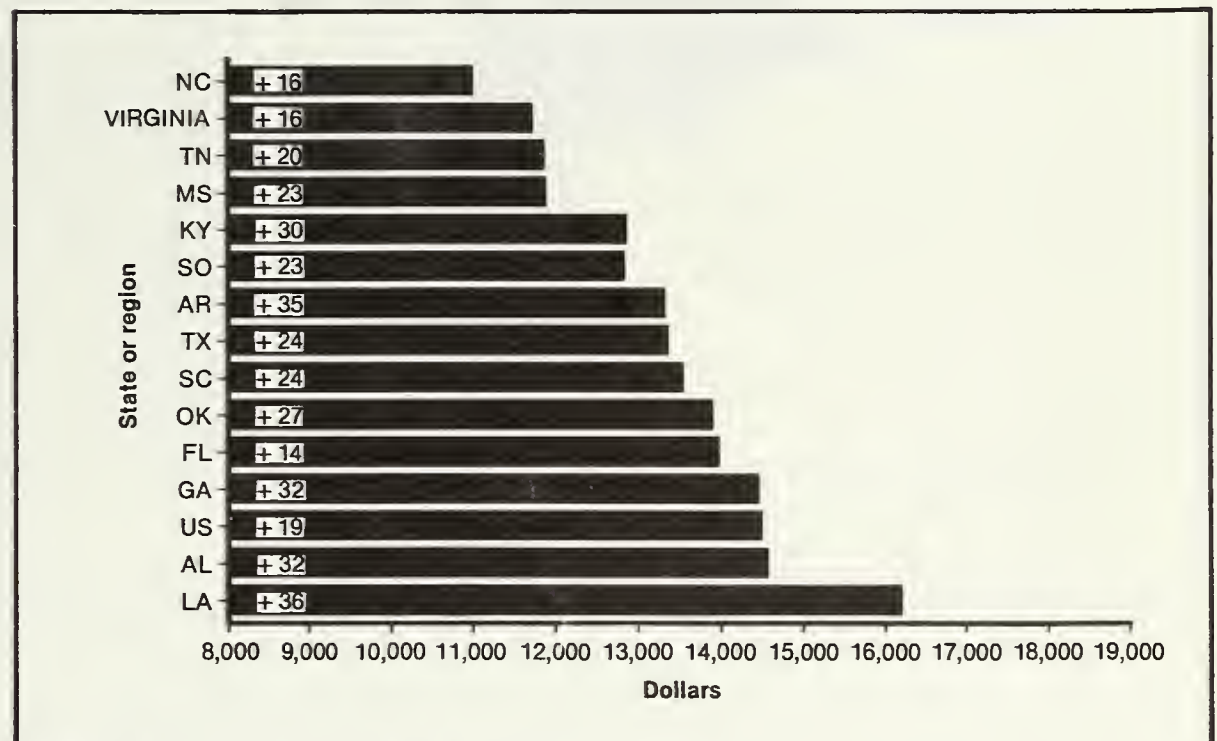


## Average Annual Earnings

Average annual earnings per worker in the forest products industry differed significantly by State in 1980; approximately \$5,000 separated the State with the highest (Louisiana) from the State with the lowest (North Carolina). Pulp and allied products manufacturing, which has traditionally paid higher wages than have other components of the forest products industry, dominated Louisiana's forest products industry. Wood furniture, which has paid lower average wages, dominated North Carolina's industry.

Average annual earnings per worker in Virginia's forest products industry were less than earnings for either the South or the United States. In addition, earnings increased at a slower pace in Virginia than in either the South or the Nation. Virginia ranked 12th among the 13 Southern States both in terms of the average earnings in 1980 and the rate of change between 1970 and 1980.

Generally speaking, paper and allied products employment dominated the forest products industry in the States with the highest average annual earnings. This relationship reflects higher job skills and unions in the paper industry. Wages, by and large, were the lowest in States where the labor-intensive wood furniture industry was of greater importance.



Numbers in bars show percentage of change from 1970 to 1980.



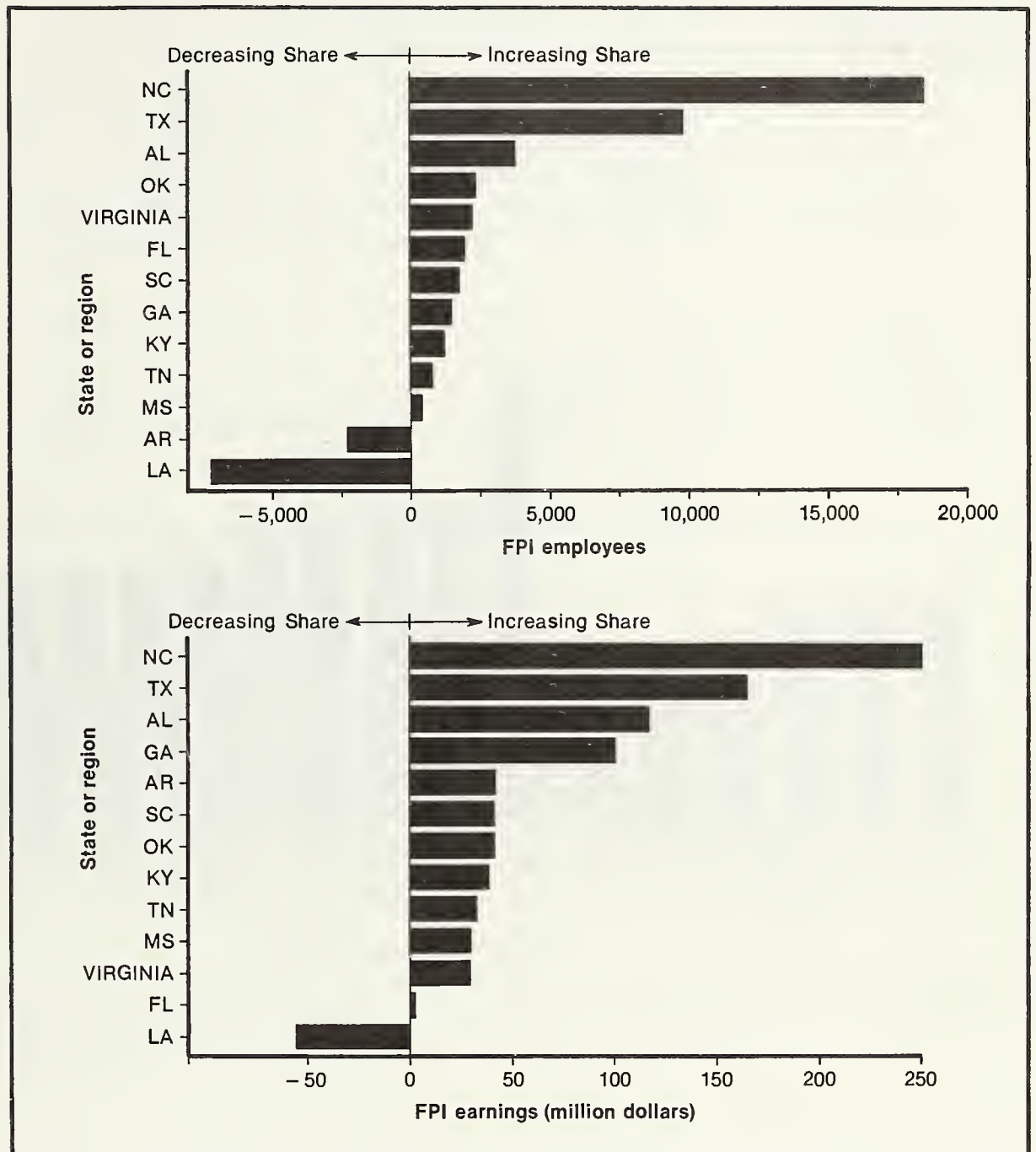
## **Shift in Employment and Earnings**

The regional shift shows how much more or less employment and earnings a State would have had in the forest products industry in 1980 had it grown at the national rate. For example, Virginia had approximately 2,300 more employees in 1980 than it would have had if its forest products industry had grown at the national rate.

Between 1970 and 1980, employment in the forest products industry increased in every Southern State except Louisiana and Arkansas; moreover, all but these two States increased their share of the Nation's forest products industry employment, and all but Louisiana increased their share of earnings. Virginia's increase in the share of the Nation's employment in the forest products industry was 5th among the 13 Southern States; its increase in the share of earnings was 11th.

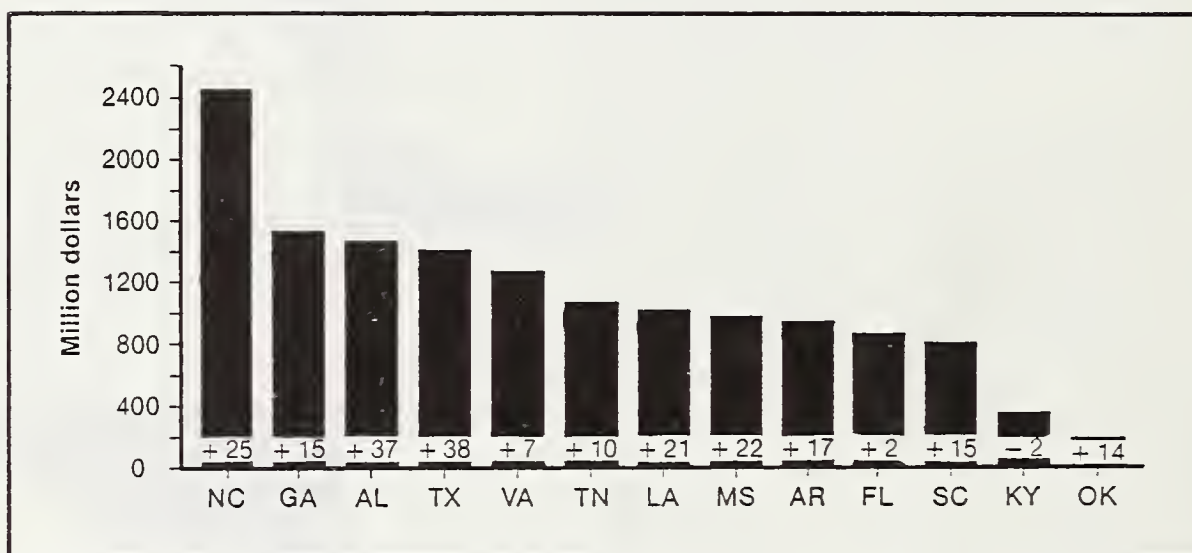
Increased shares of employment and earnings reflect the comparative advantage the South's forest products industry enjoyed over this industry in the rest of the Nation. Several factors (for example, relatively lower labor costs, lower raw materials costs, and closer proximity to markets) might account for a region's comparative advantage, although adverse trends with respect to one factor need not reduce a region's advantage. In the South, for instance, increasing labor costs need not adversely affect the comparative advantage if increased capital or labor productivity offsets higher labor costs.





# Value Added by the Forest Products Industry

In 1977, the forest products industry of North Carolina produced more value added than any other State in the South. Georgia was second among the 13 Southern States, followed by Alabama. Texas was not only one of the leading States in terms of total value added but also led the South in terms of the change in value added between 1972 and 1977. Virginia was fifth in terms of total value added. Between 1972 and 1977, the increase in total value added by Virginia's forest products industry ranked 11th among the 13 Southern States. One State, Kentucky, produced less value added in 1977 than in 1972.

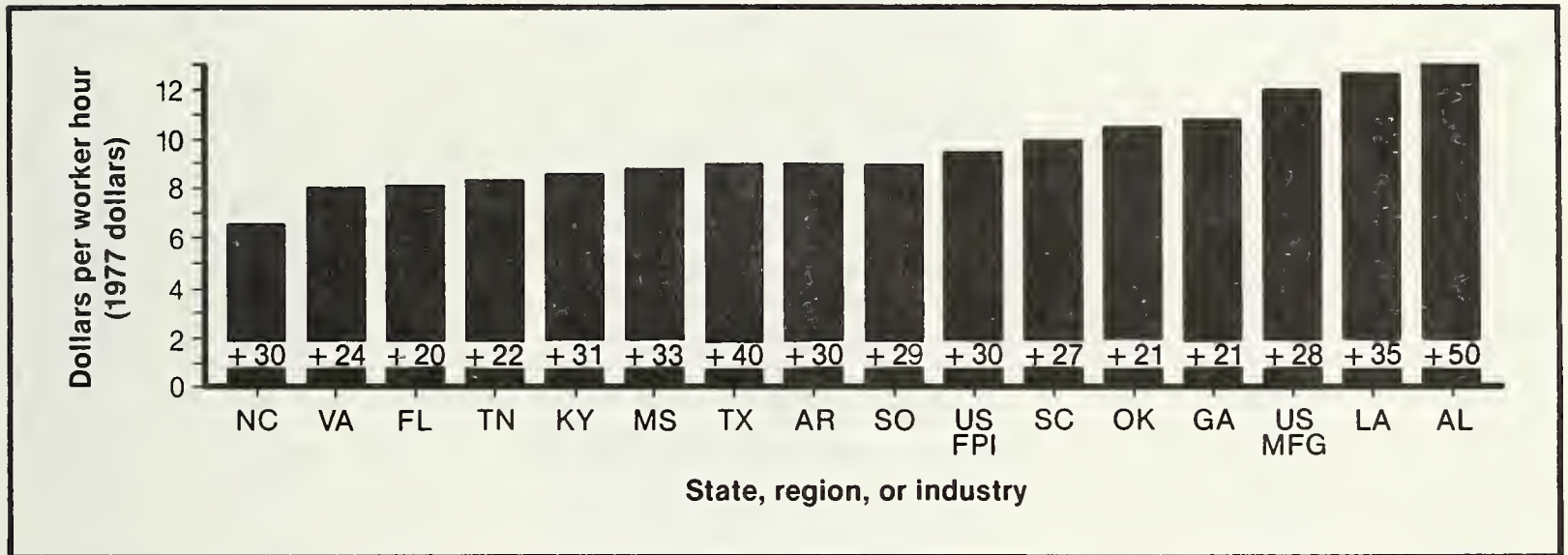


Numbers in bars show percentage of change from 1972 to 1977.

## Capital Productivity

Paper and allied products industry, which is more capital-intensive and therefore more susceptible to technological change than are other segments of the forest products industry, exhibited the highest productivity within the forest products industry. Wood furniture, on the other hand, is the most labor-intensive of the three segments. North Carolina, for example, produced more value added than any other State in the South, but the productivity of its forest products industry in 1977 was the lowest. In 1977, capital productivity of the forest products industries of North Carolina and Virginia were the lowest of the Southern States, reflecting the dominant role of the labor-intensive furniture industry.

Increases in productivity exceeded increases in payroll per worker between 1972 and 1977 for all the Southern States. This relationship is in part responsible for the South's comparative advantage in the forest products industry. The change in productivity between 1972 and 1977 was also below the regional and national levels.



Numbers in bars show percentage of change from 1972 to 1977.



## Acknowledgment

Many helpful suggestions of several reviewers were incorporated in this research paper. This project was partially funded by the USDA Forest Service, Resource Program and Assessment Staff, State and Private Forestry, Area Planning and Development, State Planning for Forest Resources.

## Appendix 1 Tables

**Table 1—Total labor and proprietorial employment and income, by industry, Virginia, 1980<sup>1/</sup>**

Industry number	Industry	Employees	Total income
		<i>Number</i>	<i>Thousand 1977 dollars<sup>2/</sup></i>
Wage and salary			
1	Agriculture	26,299	216,983
2	Agricultural services, forestry, and fisheries	8,933	93,381
3	Coal mining	19,107	468,464
4	Oil and gas extraction	152	3,834
5	Metal mining	342	4,177
6	Nonmetallic minerals	2,888	38,446
7	Construction	131,505	1,706,610
8	Food and kindred products	41,697	448,476
9	Tobacco	17,596	361,902
10	Textile mill production	45,984	453,932
11	Apparel and other textiles	333,675	235,787
12	Paper and allied products	15,449	264,472
13	Printing and publishing	22,339	270,835
14	Chemical and allied products	31,658	563,389
15	Petroleum refining	305	8,230
16	Rubber and miscellaneous plastics	11,589	171,426
17	Leather and leather products	3,595	25,823
18	Lumber and wood products, excluding mobile homes	21,852	237,276
19	Mobile homes	707	7,677
20	Wood furniture	22,562	199,496
21	Other furniture and fixtures	3,204	28,330
22	Stone, clay, and glass products	12,867	170,670
23	Primary metals	12,826	232,012
24	Fabricated metals	22,773	356,560
25	Machinery, excluding electrical	15,272	220,417
26	Electrical machinery	34,257	528,332
27	Transportation equipment, excluding motor vehicles	31,525	498,468
28	Motor vehicles	7,542	124,624
29	Ordnance	<sup>3/</sup>	<sup>3/</sup>
30	Instruments and related equipment	4,281	49,853
31	Miscellaneous manufacturing	2,806	29,846
32	Railroad transportation	14,522	276,227
33	Trucking and warehousing	28,232	411,873
34	Local transit	5,901	66,271
35	Air transportation	12,136	287,445

See footnotes at end of table.

**Table 1—Total labor and proprietorial employment and income, by industry, Virginia, 1980<sup>1/</sup> (continued)**

Industry number	Industry	Employees	Total income
		<i>Number</i>	<i>Thousand 1977 dollars<sup>2/</sup></i>
Wage and salary			
36	Pipeline transportation	119	2,806
37	Transportation services	2,967	38,348
38	Water transportation	4,907	69,074
39	Communications	30,681	569,679
40	Electrical, gas, and sanitation services	16,292	282,494
41	Wholesale trade	105,406	1,544,120
42	Retail trade	347,495	2,602,760
43	Banking	33,634	346,694
44	Other credit agencies	18,078	235,613
45	Insurance	29,152	422,233
46	Real estate and combinations	29,942	375,888
47	Hotel and other lodging	30,496	202,336
48	Personal, miscellaneous business, and repair services	115,583	1,326,027
49	Auto repair service	12,232	144,981
50	Amusement	14,354	90,097
51	Motion pictures	2,933	15,644
52	Private households	54,552	155,131
53	Medical and other health	105,865	1,384,659
54	Private education	25,460	180,978
55	Nonprofit organizations	60,112	467,216
56	Miscellaneous services	36,489	767,967
57	Federal civilian	164,103	2,810,280
58	Federal military	175,557	1,798,029
59	State and local government	335,678	3,009,156
Proprietorial			
60	Farm proprietors	66,203	131,669
61	Nonfarm proprietors	141,646	1,460,254
	Total	2,626,405	29,495,707

<sup>1/</sup>Source of data for this table for Virginia, other States of the South, and the United States: unpublished data, U.S. Department of Commerce, Regional Economics Measurements Division, Regional Economic Information System (REIS), Washington, DC, 1982. Unpublished data used by the U.S. Department of Commerce in preparing their *County Business Patterns* (CBP) series on employment and payroll were used to differentiate wood-related from nonwood-related employment and earnings. For example, CBP data were used to separate mobile homes (no. 19) from the lumber and wood products (no. 18) industry. Wood furniture (no. 20) was similarly separated from other furniture and fixtures (no. 21).

<sup>2/</sup>The Personal Consumption Expenditures (PCE) deflator, 1977 = 100, was used to deflate actual dollars.

<sup>3/</sup>Included with fabricated metals and other related industries.

**Table 2—Calculation of 1980 dependency indexes for Virginia<sup>1/</sup>**  
(In percent)

Industry	Employment		Virginia excess employment <sup>2/</sup>	Dependency index <sup>3/</sup>
	Virginia	United States		
Agriculture	1.18	1.46	—	—
Agricultural services, forestry, and fisheries	.40	.62	—	—
Farm proprietors	2.96	3.03	—	—
Coal mining	.85	.27	0.58	3.82
Oil and gas extraction	.01	.60	—	—
Metal mining	.02	.11	—	—
Nonmetallic minerals	.13	.14	—	—
Construction	5.88	4.74	1.14	7.49
Food and kindred products	1.86	1.87	—	—
Tobacco	.79	.07	.71	4.69
Textile mill production	2.06	.93	1.13	7.41
Apparel and other textiles	1.51	1.39	.12	.79
Paper and allied products	.69	.76	—	—
Printing and publishing	1.00	1.37	—	—
Chemical and allied products	1.42	1.22	.20	1.30
Petroleum refining	.01	.22	—	—
Rubber and miscellaneous plastics	.52	.80	—	—
Leather and leather products	.16	.26	—	—
Lumber and wood products, excluding mobile homes	.98	.71	.27	1.77
Mobile homes	.03	.05	—	—
Wood furniture	1.01	.32	.69	4.52
Other furniture and fixtures	.14	.19	—	—
Stone, clay, and glass products	.58	.73	—	—
Primary metals	.57	1.26	—	—
Fabricated metals	1.02	1.77	—	—
Machinery, excluding electrical	.68	2.73	—	—
Electrical machinery	1.53	2.31	—	—
Transportation equipment, excluding motor vehicles	1.41	1.21	.20	1.30
Motor vehicles	.34	.87	—	—
Instruments and related equipment	.19	.77	—	—
Miscellaneous manufacturing	.13	.47	—	—
Railroad transportation	.65	.58	.07	.43
Trucking and warehousing	1.26	1.40	—	—
Local transit	.26	.29	—	—
Air transportation	.54	.50	.04	.29
Pipeline transportation	.01	.02	—	—
Transportation services	.13	.22	—	—
Water transportation	.22	.23	—	—
Communications	1.37	1.48	—	—
Electrical, gas, and sanitation services	.73	.90	—	—
Wholesale trade	4.71	5.79	—	—
Retail trade	15.54	16.50	—	—
Banking	1.50	1.72	—	—
Other credit agencies	.81	.99	—	—

See footnotes at end of table.



**Table 2—Calculation of 1980 dependency indexes for Virginia<sup>1/</sup> (continued)**  
(In percent)

Industry	Employment		Virginia excess employment <sup>2/</sup>	Dependency index <sup>3/</sup>
	Virginia	United States		
Insurance	1.30	1.89	—	—
Real estate and combinations	1.34	1.16	.18	1.18
Hotel and other lodging	1.36	1.20	.16	1.08
Personal, miscellaneous business, and repair services	5.17	4.69	.48	3.13
Auto repair service	.55	.63	—	—
Amusement	.64	.84	—	—
Motion pictures	.13	.24	—	—
Medical and other health	4.73	5.71	—	—
Private education	1.14	1.47	—	—
Nonprofit organizations	2.69	3.01	—	—
Miscellaneous services	1.63	1.63	—	—
Federal civilian	7.34	3.27	4.08	26.78
Federal military	7.85	2.68	5.17	34.04
Nonfarm proprietors	6.33	7.66	—	—
Total <sup>3/</sup>	100.00	100.00	15.19	100.00

<sup>1/</sup>Virginia employment minus U.S. employment. Figures may not be exactly equal to U.S. minus Virginia because of rounding. Dashes signify no excess employment.

<sup>2/</sup>Individual industry excess employment expressed as a percentage of Virginia's total excess employment (sum of column 4).

<sup>3/</sup>Sum of parts may not equal totals because of rounding.

**Table 3—Value added, hours worked, payroll, and capital productivity,<sup>1/</sup>  
Virginia forest products industry, 1977<sup>2/</sup>**

Industry	Value added	Payroll	Hours worked	Productivity	Productivity change, 1972-77
	--- \$Million ---		Million	\$VAMP per hour	Percent
Lumber and wood products	405.7	182.3	33.8	6.61	11.41
Wood furniture	315.4	164.6	38.2	3.95	-15.42
Paper and allied products	546.2	187.7	19.7	18.20	75.02

<sup>1/</sup>Productivity equals value added minus payroll (VAMP) divided by hours worked. For a discussion of VAMP, see W. Charles Sawyer and Joseph A. Ziegler, 1980. "The use of VAMP shift as a predictive model." Unpublished paper presented at the annual meeting of the Western Regional Science Association, Monterey, California.

<sup>2/</sup>Source: U.S. Bureau of the Census, Census of Manufactures, for 1972 and 1977, Virginia and the United States, available in 1976 and 1980, respectively. In the few instances where data were not available for some segments of the forest products industry, the distribution of the number of establishments was used to estimate nondisclosures.

**Appendix 2**  
**Virginia Counties by**  
**Sub-State Planning and**  
**Development Districts**

District code	Counties
1	Lee, Scott, Wise
2	Buchanan, Dickenson, Russell, Tazewell
3	Bland, Carroll, Grayson, Smyth, Washington, Wythe
4	Floyd, Giles, Montgomery, Pulaski
5	Alleghany, Botetourt, Craig, Roanoke
6	Augusta, Bath, Highland, Rockbridge, Rockingham
7	Clarke, Frederick, Page, Shenandoah, Warren
8	Arlington, Fairfax, Loudoun, Prince William
9	Culpeper, Fauquier, Madison, Orange, Rappahannock
10	Albemarle, Fluvanna, Greene, Louisa, Nelson
11	Amherst, Appomattox, Bedford, Campbell
12	Franklin, Henry, Patrick, Pittsylvania
13	Brunswick, Halifax, Mecklenburg
14	Amelia, Buckingham, Charlotte, Cumberland, Lunenburg, Nottoway, Prince Edward
15	Charles City, Chesterfield, Goochland, Hanover, Henrico, New Kent, Powhatan
16	Caroline, King George, Spotsylvania, Stafford
17	Lancaster, Northumberland, Richmond, Westmoreland
18	Essex, Gloucester, King and Queen, King William, Mathews, Middlesex
19	Dinwiddie, Greensville, Prince George, Surry, Sussex
20	Isle of Wight, Nansemond, Southampton
21	James City, York
22	Accomack, Northampton

**Schallau, Con H; Maki, Wilbur R.; Foster, Bennett B.; Redmond, Clair H.**

Virginia's forest products industry: performance and contribution to the State's economy, 1970 to 1980. Res. Pap. PNW-368. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; 1986. 22 p.

Employment and earnings in Virginia's forest products industry, like those of most Southern States, increased between 1970 and 1980. Furthermore, Virginia's share of the Nation's forest products employment and earnings increased during this period. In 1980, the wood furniture segment accounted for the largest share of the industry's employment, but paper and allied products accounted for the largest share of earnings. In 1977, pulp and allied products had higher productivity than either lumber and wood products or wood furniture.

Keywords: Forest products industries, economics (forest products industries), employment (forest products industries), Virginia.

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